

## Implementation of software organization at CERN (+ an update...)

Elisabetta Pennacchio, IPNL

- A stable and complete working environment for WA105 is available at CCIN2P3 from February 2015
- All software packages are also available: CRY, GENIE, Globes, NuFitter, Qscan (old and new version....)

```
2015 CRY
2015 GENIE
2015 GlobesSimu
2015 Qscan_version-1.0
2015 Qscan_v1.1
2015 WA105Soft_v1.0
2015 GENIE_inputfileforQscan -> /sps/hep/lbno/dataset/GENIE_inputfile_forQscan
2015 Qscan -> Qscan_v1.1
2015 Light_Simulation
2015 README
15:27 WA105Soft
15:31 WA105Soft_v3.0
```

- In order to be able to run at CERN the reconstruction during the 3x1x1 data taking the same working environment has also implemented on lxplus. It is an exact replication of what we have at the CCIN2P3.
- Next slides describe how to use Qscan at CERN and how to connect to the svn server

**Main directory:** </afs/cern.ch/exp/wa105/Public>

```
epennacc wa105-comp 2048 Jul 19 11:44 kits
epennacc wa105-comp 2048 Jul 19 11:58 dataset
epennacc wa105-comp 2045 Jul 19 15:11 WA105_setup.sh
epennacc wa105-comp 2048 Jul 20 19:14 WA105Soft
```

**3 sub-directories :**

**kits:** external libraries and needed packages (ROOT, Geant,..., same versions installed at CCIN2P3 in \$KITS\_DIR )

**dataset:** files to be used as input to Qscan (field maps, light maps.... subsample of files available in /sps/hep/lbno/DATASET)

**WA105Soft:** simulation and reconstruction code

# Working environment

- The working environment is set by `/afs/cern.ch/exp/wa105/Public/WA105Soft_setup.sh`  
This file defines the complete working environment for the CERN default bash shell  
(\$ROOTSYS, \$G4INSTALL, \$G3SYS,...) and also alias and variable to access eos and CASTOR
- André has prepared **WA105Soft\_setup.csh** for those who use csh
- To source this file two possibilities are available:
  - 1) source the file manually at each login
  - 2) modify `.bash_profile` to source WA105Soft\_setup.sh automatically at each login (should be preferred) →

from home directory: `ls -a`

```
[epennacc@lxplus0004 ~]$ ls -a
.  ..  .bash_history  .bash_profile  .bashrc  .forward  .nedit  private  public
```

```
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi

# User specific environment and startup programs

PATH=$PATH:$HOME/bin

export PATH
```

Line to be added →

```
source /afs/cern.ch/exp/wa105/Public/WA105_setup.sh
```

# Validation

To check that the environment is correctly set up and that **simulation** and **reconstruction** can be run, 10 events (muons in gun mode) have been generated and processed in the 3x1x1 and 6x6x6 configuration. **Benchmark distributions** have also been produced for raw data, hit and track reconstructions.

Output ROOT files are available:

```
/afs/cern.ch/exp/wa105/Public/WA105Soft/Qscan
[epennacc@lxplus0004 Qscan]$ ls -rtl *.root
-rw-r--r--. 1 epennacc wa105-comp 20868374 Jul 21 14:04 WA105_output_666.root
-rw-r--r--. 1 epennacc wa105-comp 3140669 Jul 21 14:08 WA105_output_311.root
-rw-r--r--. 1 epennacc wa105-comp 2087720 Jul 21 14:11 recotask_WA105_output_666.root
-rw-r--r--. 1 epennacc wa105-comp 404107 Jul 21 14:12 recotask_WA105_output_311.root
[epennacc@lxplus0004 Qscan]$
```

```
[epennacc@lxplus0004 benchmark]$ pwd
/afs/cern.ch/exp/wa105/Public/WA105Soft/benchmark
[epennacc@lxplus0004 benchmark]$ ls -rtl *.root
-rw-r--r--. 1 epennacc wa105-comp 28050 Jul 21 14:13 bench_WA105_output_666_pass2.root
-rw-r--r--. 1 epennacc wa105-comp 13281 Jul 21 14:13 bench_WA105_output_311_pass2.root
-rw-r--r--. 1 epennacc wa105-comp 31860 Jul 21 14:13 bench_recotask_WA105_output_666_pass11.root
-rw-r--r--. 1 epennacc wa105-comp 69384 Jul 21 14:13 bench_recotask_WA105_output_666_pass12.root
-rw-r--r--. 1 epennacc wa105-comp 24485 Jul 21 14:14 bench_recotask_WA105_output_311_pass12.root
-rw-r--r--. 1 epennacc wa105-comp 14621 Jul 21 14:14 bench_recotask_WA105_output_311_pass11.root
[epennacc@lxplus0004 benchmark]$
```

*The same events have also been produced at CCIN2P3, and benchmark distributions are identical.*

# To get the code

- 1) Copy /afs/cern.ch/exp/wa105/Public/WA105Soft/WA105Soft.tgz in your working directory, unpack it and start working
  - 2) Checkout the code from the **svn server**
    - Instructions to ask for an account can be found here:  
[http://lbnodemo.ethz.ch:8080/Plone/software/workbook/repositories/svn\\_WA105.pdf/view](http://lbnodemo.ethz.ch:8080/Plone/software/workbook/repositories/svn_WA105.pdf/view)
    - if you already have an account:  
copy the following files from your .ssh directory (from the machine you are using to connect to the svn)
- key\_for\_svn.in2p3.fr*  
*key\_for\_svn.in2p3.fr.pub*  
*config*
- to the .ssh directory on lxplus

```
[epennacc@lxplus0004 .ssh]$ pwd
/afs/cern.ch/user/e/epennacc/.ssh
[epennacc@lxplus0004 .ssh]$ ls -rtl
total 11
-rw-r--r--. 1 epennacc wa105-comp 398 Jul  7 10:34 key_for_svn.in2p3.fr.pub
-rw-r--r--. 1 epennacc wa105-comp 366 Jul  7 10:34 config
-rw-----. 1 epennacc wa105-comp 1766 Jul  7 10:37 key_for_svn.in2p3.fr
-rw-r--r--. 1 epennacc def-cg 6208 Jul 19 08:56 known_hosts
[epennacc@lxplus0004 .ssh]$
```

## How to check out code :

```
[epennacc@lxplus094 WA105]$ svn co svn+ssh://pennacc@svn.in2p3.fr/wa105/WA105Soft
Enter passphrase for key '/afs/cern.ch/user/e/epennacc/.ssh/key_for_svn.in2p3.fr':
Enter passphrase for key '/afs/cern.ch/user/e/epennacc/.ssh/key_for_svn.in2p3.fr':
A      WA105Soft/anautils
A      WA105Soft/anautils/src
A      WA105Soft/anautils/src/CRTracksAnaDEDX.cc
A      WA105Soft/anautils/src/CRPQAnaStore.cc
A      WA105Soft/anautils/inc
A      WA105Soft/anautils/inc/CRTracksAnaDEDX.h
A      WA105Soft/anautils/inc/CRPQAnaStore.h
A      WA105Soft/anautils/Makefile
A      WA105Soft/elecssim
```

## How to commit:

```
svn: not enough arguments provided
[epennacc@lxplus094 Qscan]$ svn commit
Enter passphrase for key '/afs/cern.ch/user/e/epennacc/.ssh/key_for_svn.in2p3.fr':
Sending          Qscan/WA105_example.datacard
Transmitting file data .
Committed revision 341.
[epennacc@lxplus094 Qscan]$
```

# CONCLUSIONS

- A working environment to run Qscan has been set-up at CERN in view of the 3x1x1 data taking. It is a replication of the CCIN2P3 environment.
- The svn server already in use can be accessed from the CERN machines
- The same events have been generated and reconstructed at CERN and at CCIN2P3, and results are identical. No major problems showed up, but please note that this platform has been so far only tested by few people.
- One last point has to be stressed: CERN is phasing out AFS.  
This installation cannot be \*THE FINAL\* installation that will be used during WA105 life: for sure in the next months we will have to migrate it.



## Update on the code for purity measurement (code availability)

The method used to measure purity has been presented at the SB meeting of July 6<sup>th</sup>  
<https://indico.fnal.gov/conferenceDisplay.py?confId=12481>

The code is now available on svn



File ^	Rev.	Age
Parent Directory		
Qscan/	<a href="#">349</a>	2 days
anautils/	<a href="#">342</a>	2 weeks
benchmark/	<a href="#">343</a>	9 days
bin/	<a href="#">356</a>	39 hours
crp/	<a href="#">295</a>	2 months
daq/	<a href="#">350</a>	2 days
datamodel/	<a href="#">326</a>	4 weeks
datautils/	<a href="#">350</a>	2 days
dlarvmc/	<a href="#">310</a>	2 months
elecsim/	<a href="#">310</a>	2 months
guiutils/	<a href="#">350</a>	2 days
include/	<a href="#">33</a>	15 months
lib/	<a href="#">33</a>	15 months
lowrecon/	<a href="#">331</a>	3 weeks
lro/	<a href="#">273</a>	2 months
macros/	<a href="#">301</a>	2 months
purity/		

### Index of /WA105Soft/purity

Files shown: 2

Directory revision: [357](#) (of [357](#))

Sticky Revision:

File ^	Rev.	Age
Parent Directory		
inc/	<a href="#">352</a>	2 days
src/	<a href="#">357</a>	21 hours
work/	<a href="#">355</a>	41 hours
Makefile	<a href="#">352</a>	2 days
README	<a href="#">352</a>	2 days

a README file is available

```
[pennacc@cca008 purity]$ more README
```

```
-----  
How to run the code for purity measurement  
-----
```

You can find the following directories:

```
inc  
src  
work
```

the Makefile (and this README).

1) run make to get purity.exe (if needed)

```
> make
```

2) enter in work directory

```
> cd work  
> ls -rtl
```

**readme**

**Explanation of different files/directories**

```
purity.sh --> script to be used  
purity.exe --> ../purity.exe --> link to executable  
input --> directory for scripts and macros needed by purity.sh , you do not need to modify it
```

3) now you need to link a root file of reconstructed data, reco.root

4) to run the code:  
source purity.sh reco.root

**How to run the code**

this create a directory: purity\_reco\_dchmyy\_hhmmss

in purity\_reco\_dchmyy\_hhmmss there are two relevant files:

--> fitresult\_dchmyy\_hhmmss.listing: ascii file with purity values for view 0 and view1 obtained from fit

--> purity\_dchmyy\_hhmmss.listing:: general information about input file (reco.root)

A pdf file, purity\_dchmyy\_hhmmss.pdf is also available

**List of output files**

Please note that the scripts ends in a root session

## An example:

```
[pennacc@cca008 purity]$ ls -rtl
total 224
-rw-r--r-- 1 pennacc lbno 1113 Jul 20 08:51 README
drwxr-sr-x 2 pennacc lbno 512 Jul 20 08:51 inc
-rw-r--r-- 1 pennacc lbno 380 Jul 20 08:51 Makefile
drwxr-sr-x 2 pennacc lbno 512 Jul 20 08:53 src
-rwxr-xr-x 1 pennacc lbno 211265 Jul 20 08:53 purity.exe
drwxr-sr-x 7 pennacc lbno 8192 Jul 22 15:59 work
[pennacc@cca008 purity]$ cd work
[pennacc@cca008 work]$ date
Fri Jul 22 16:00:19 CEST 2016
[pennacc@cca008 work]$ source purity.sh reco_WA105_diagonale_lt.root
----->processing input file
----->file reco_WA105_diagonale_lt.root will be analyzed
```

Enter in work directory  
and run the code

```
[pennacc@cca008 work]$ source purity.sh reco_WA105_diagonale_lt.root
---->processing input file
---->file reco WA105 diagonale lt.root will be analyzed
```

```
---->fitting all histograms
```

```
---->creating directory and script
```

```
*****
*
*          W E L C O M E  to  R O O T
*
*   Version   5.34/23   7 November 2014
*
*   You are welcome to visit our Web site
*       http://root.cern.ch
*
*****
```

```
ROOT 5.34/23 (v5-34-23@v5-34-23, Jun 05 2015, 15:10:19 on linuxx8664gcc)
```

```
CINT/ROOT C/C++ Interpreter version 5.18.00, July 2, 2010
```

```
Type ? for help. Commands must be C++ statements.
```

```
Enclose multiple statements between { }.
```

```
root [0]
```

```
Processing fitbin.C...
```

```
Info in <TCanvas::MakeDefCanvas>: created default TCanvas with name c1
```

```
root [0]
```

```
Processing fit_mop.C...
```

```
FCN=40.2725 FROM MIGRAD      STATUS=CONVERGED      138 CALLS      139 TOTAL
                        EDM=1.04993e-09    STRATEGY= 1      ERROR MATRIX ACCURATE
```

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	p0	9.94469e-01	1.87160e-03	2.58584e-06	-7.30028e-03
2	p1	3.07342e+03	8.22566e+00	1.13639e-02	-7.01392e-06

```
FCN=46.8564 FROM MIGRAD      STATUS=CONVERGED      137 CALLS      138 TOTAL
                        EDM=1.45369e-06    STRATEGY= 1      ERROR MATRIX ACCURATE
```

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	p0	9.89968e-01	1.79760e-03	2.74212e-06	3.18883e-01
2	p1	3.07585e+03	8.05299e+00	1.22804e-02	-1.45771e-04

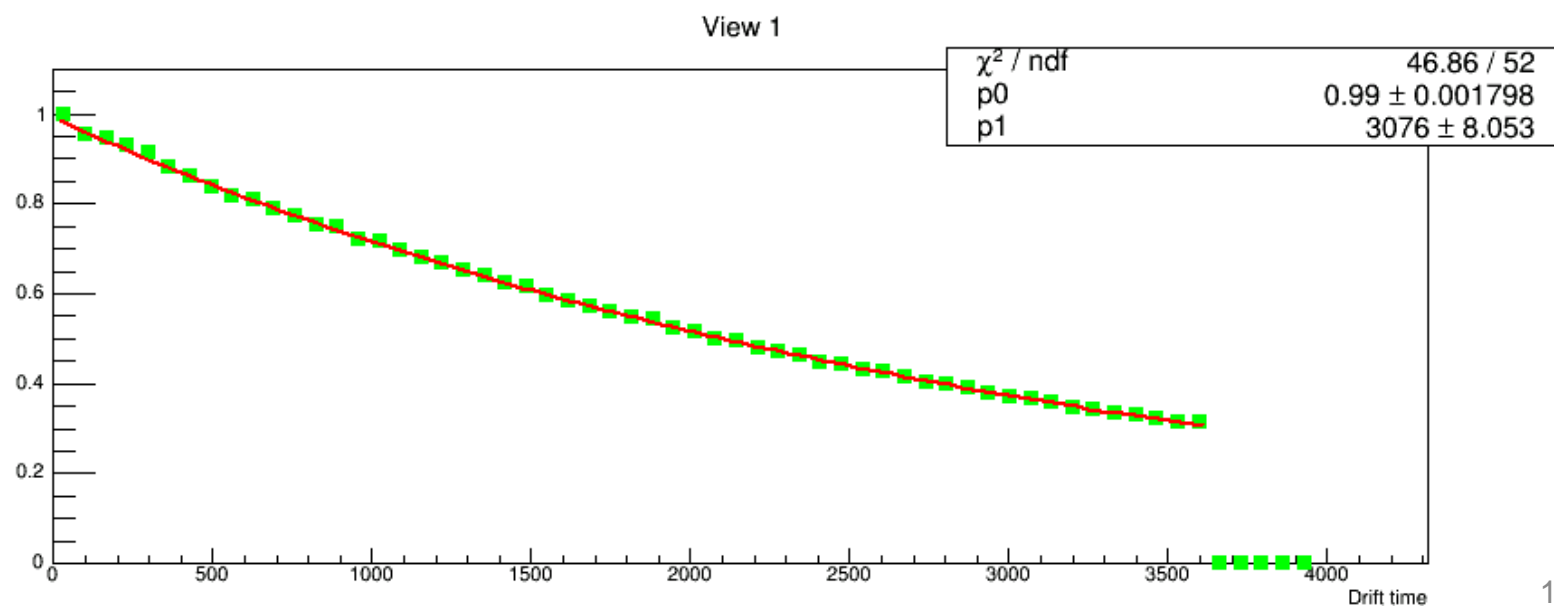
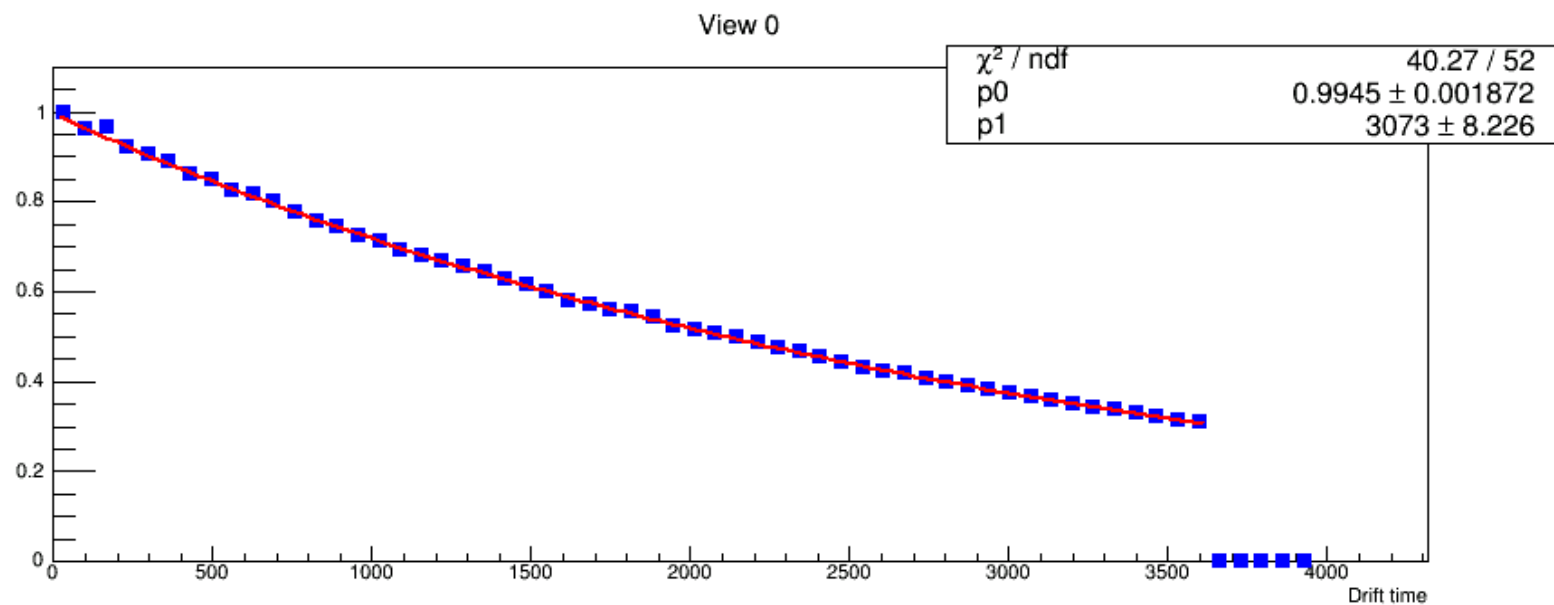
```
Info in <TCanvas::Print>: pdf file purity.pdf has been created
```

drift distance is divided in bins

Purity is computed  
for the 2 views

Fit results are shown

2016-07-22 11:24:05



A directory has been created in purity/work

```
[pennacc@cca008 work]$ ls -rtl
```

```
Jul 22 16:04 purity_reco_WA105_diagonale_lt_220716_160038
```

Name of input file

run time:  
format *ddmmyy\_hhmmss*

Contents of the directory:

```
[pennacc@cca008 purity_reco_WA105_diagonale_lt_220716_160038]$ ls -rtl
total 144
-rw-r--r-- 1 pennacc lbno 1971 Jul 22 16:00 purity_reco_WA105_diagonale_lt.listing
-rw-r--r-- 1 pennacc lbno 54562 Jul 22 16:00 purity_reco_WA105_diagonale_lt.root
lrwxrwxrwx 1 pennacc lbno 31 Jul 22 16:00 fit.listing -> fitresult_220716_160038.listing
-rw-r--r-- 1 pennacc lbno 4357 Jul 22 16:00 fitbin.C
-rw-r--r-- 1 pennacc lbno 306 Jul 22 16:00 write_macro.sh
-rw-r--r-- 1 pennacc lbno 1550 Jul 22 16:00 fit2_mop.input
lrwxrwxrwx 1 pennacc lbno 35 Jul 22 16:00 tbin.root -> purity_reco_WA105_diagonale_lt.root
-rw-r--r-- 1 pennacc lbno 7112 Jul 22 16:00 tbin_mean.list
-rw-r--r-- 1 pennacc lbno 6794 Jul 22 16:00 tbin_fit.list
-rw-r--r-- 1 pennacc lbno 6060 Jul 22 16:00 mop.input
-rw-r--r-- 1 pennacc lbno 446 Jul 22 16:00 fit1_mop.input
-rw-r--r-- 1 pennacc lbno 8056 Jul 22 16:00 fit_mon.C
-rw-r--r-- 1 pennacc lbno 66 Jul 22 16:00 fitresult_220716_160038.listing
-rw-r--r-- 1 pennacc lbno 17382 Jul 22 16:00 purity_220716_160038.pdf
```

Output from  
intermediate  
steps and  
service files

```
[pennacc@cca008 purity_reco_WA105_diagonale_lt_220716_160038]$ more fitresult_220716_160038.listing
220716_160038
view 0: 3073.42 8.22566
view 1: 3075.85 8.05299
```

→ **purity\_220716\_160038.pdf** : picture of slide 13